

## Education Connection

### STEM21 Academy

Science, Technology, Engineering and Math Education for the 21st Century

**DID HIGH-NEEDS HIGH SCHOOL STUDENTS WHO PARTICIPATED IN STEM21 ACADEMY DEMONSTRATE GREATER SCIENCE ACHIEVEMENT AND COLLEGE AND CAREER INTEREST IN STEM THAN THEIR COUNTERPARTS**

## Project Overview

### THE INTERVENTION

#### **THE PROBLEM: What Challenge Did the Program Try to Address?**

The goal of the STEM21 Academy<sup>1</sup> program was to engage high-needs students in STEM fields and boost achievement, college and career interest in STEM fields. Low-income, minority, and female students are typically underrepresented in STEM fields and have lower rates of achievement than white, male peers.

#### **THE PROJECT: What Strategies Did the Program Employ?**

Education Connection designed and implemented the STEM21 Academy intervention in 10 northeastern high schools (9<sup>th</sup> – 12<sup>th</sup> grade) upon receiving an i3-funded development grant from 2010 – 2015. The program was intended to provide a standards-based, 9<sup>th</sup> – 12<sup>th</sup> grade course sequence in STEM fields (mathematics, science, and technology) delivered through engaging and interactive learning experiences. The program was evaluated through a quasi-experimental study in which students self-selected to participate in the STEM21 Academy; a control group was constructed by pairing students in the same schools who received “business-as-usual” science instruction, to 114 students who received the STEM21 treatment.

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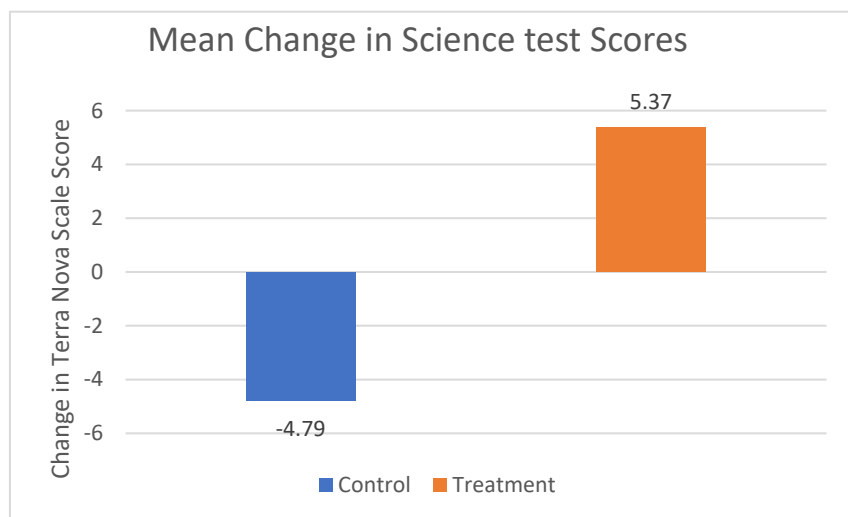
<sup>1</sup> Education Connection received an i3 development grant supported by the U.S. Department of Education’s Investing in Innovation program through Grant Number U396C100520. Development grants provide funding to support the development or testing of novel or substantially more effective practices that address widely shared education challenges. All i3 grantees are required to conduct rigorous evaluations of their projects. The quality of evidence required to demonstrate a project’s effectiveness depends on a project’s level of scale or grant type.

## THE STEM ACADEMY MODEL

- **The STEM21 Academy Model.** STEM21 Academy was delivered as a sequence of courses in STEM fields (math, science, and technology) to high school students through a blended learning environment of online instruction, guided by teachers in classroom.

## Summary of Results

### DID STEM21 INCREASE SCIENCE ACHIEVEMENT AND COLLEGE AND CAREER INTEREST?



The STEM21 program did not have an impact on students' science achievement or interest in college and career.

- **SCIENCE ACHIEVEMENT.** No statistically significant positive effect on science achievement was found after two years of STEM21 Academy. The science achievement impact was studied by evaluating student scores on the Terranova standardized test.
- **STEM INTEREST FOR COLLEGE AND CAREER.** Based on survey results given to both treatment and control group students, there was no evidence that the STEM21 Academy resulted in increased college and career interest in STEM.

Please see Appendices B and C for information about the evaluation's design and the quality of the evidence, respectively.

### SECONDARY FINDINGS

After the i3-funded study, the evaluators assessed and reported the results of two additional exploratory analyses. The takeaways from these are listed below.

- **BIAS AND LOW SAMPLE SIZES.** Because of the small number of schools (10) that participated in the study, bias from school culture cannot be ruled out. In addition, the study suffered from an overall low sample size, making it difficult to draw conclusions.
- **ONE-YEAR ACHIEVEMENT IN STEM21.** Students in 12 Northeastern high schools were assessed after one year of exposure to the intervention. This assessment was conducted through the standardized test, TerraNova. After one year, there was evidence of small gains in achievement, compared to business as usual. This finding indicates that it is possible that the STEM21 Academy intervention is effective at improving achievement, but the effect may dissipate by year two.
- **ONE-YEAR PERCEPTIONS OF SELF-CONCEPT.** After one year of exposure to the intervention, as part of the STEM21 Survey, students were measured on their perceptions of their own abilities in STEM related subjects and tasks. This analysis found evidence of a small gain in self-concept associated with participation in the intervention compared to peers who did not receive the intervention, but the effect may dissipate by year two.

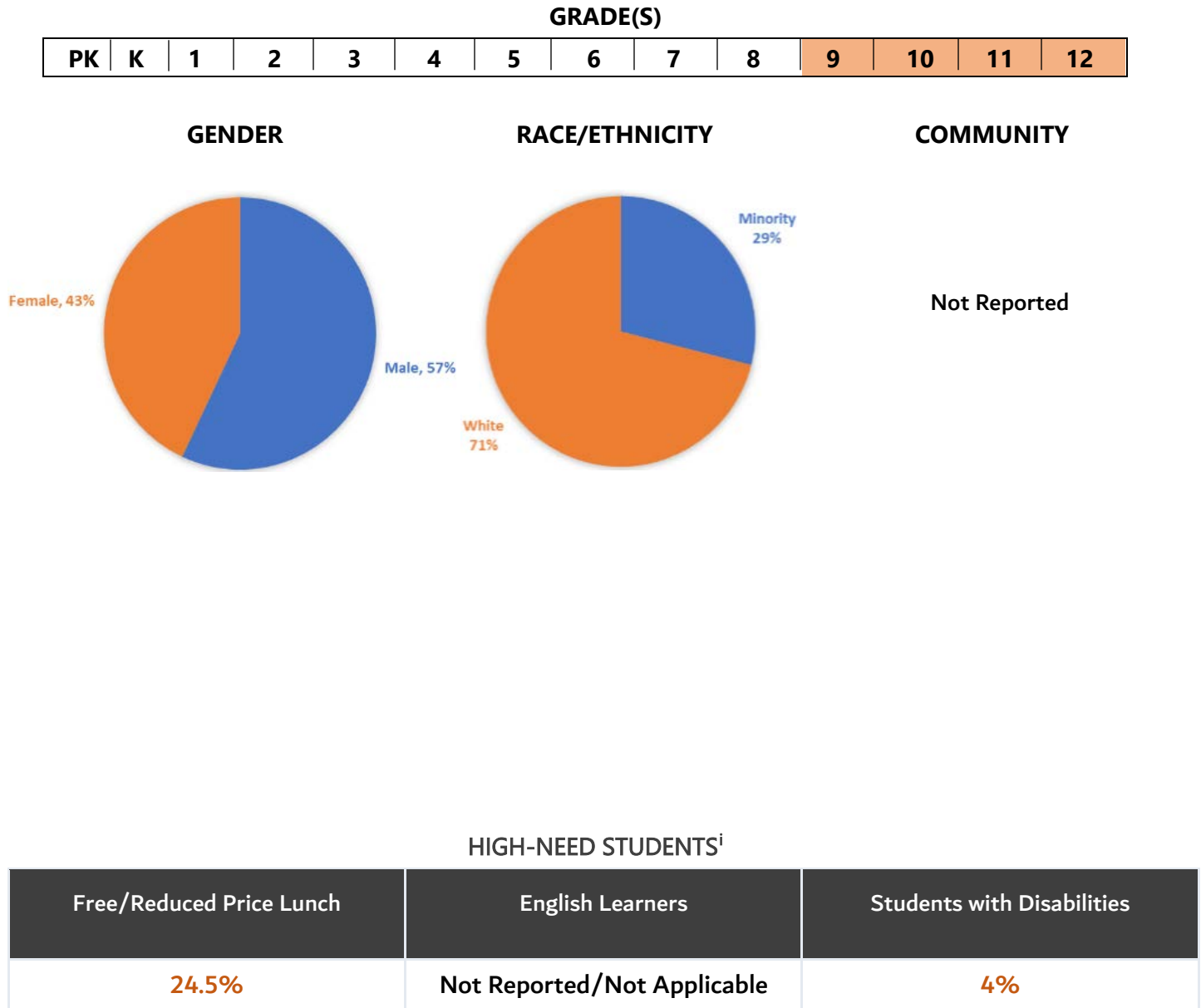
## For More Information

### Evaluation Reports

[Final Evaluation Report \(2015\) \(PDF\)](#)(Education Development Center, Inc., December 2015)<sup>2</sup>

<sup>2</sup> The information and data for this report was collected from the most recent report as of 01/23/2020, Science, Technology, Engineering and Math Education for the 21<sup>st</sup> Century (STEM21) High School Impact Evaluation: Final Evidence Report from Education Development Center, Inc. (2015).

## Appendix A: Students Served by the Project<sup>3</sup>



<sup>3</sup>These data reflect the entire student population served by the intervention, not just the evaluation sample used in the impact study.

## Appendix B: Impact Evaluation Methodology<sup>4</sup>

### RESEARCH DESIGN:

<b>Design:</b>	Quasi-experimental design
<b>Approach:</b>	<ul style="list-style-type: none"><li>Propensity score matching, and using pre-test scores and demographic characteristics as covariates, allowed multilevel regression analysis to estimate the effect of the intervention. Students were given pre-tests at the start of their 9<sup>th</sup> grade year and were post-tested at the end of the 10<sup>th</sup>. The control group comprised of students in regular science courses who were sampled to resemble the demographic characteristics of the treatment group. Closest distance matching was employed to reduce baseline differences to an acceptable level. Terranova, a standardized norm-referenced test designed to measure knowledge on scientific theory and application, was used to measure science achievement. The Career and Education section of the STEM21 Survey measured students' interest in STEM fields for college and career.</li></ul>
<b>Study Length:</b>	Five academic years (Fall 2010 – Spring 2015)

### DATA COLLECTION AND ANALYSIS

<b>Study Setting:</b>	Ten high schools in the Northeastern United States
<b>Final Sample Sizes:</b>	<ul style="list-style-type: none"><li><i>Intervention:</i> 114 students</li><li><i>Comparison:</i> 114 students</li></ul>
<b>Intervention Group Characteristics:</b>	<ul style="list-style-type: none"><li><i>Intervention:</i> 24.5% Percent Free/Reduced Lunch, 4% Special Education, 57% Male, 29% Minority</li></ul>
<b>Comparison Group Characteristics</b>	<ul style="list-style-type: none"><li><i>Comparison:</i> 33% Free/Reduced Lunch, 1.7% Special Education, 46% Male, 30% Minority</li></ul>
<b>Data Sources:</b>	<ul style="list-style-type: none"><li>Standardized test scores</li><li>Student surveys</li></ul>
<b>Key Measures:</b>	<ul style="list-style-type: none"><li>Terranova</li><li>STEM21 Survey</li></ul>

<sup>4</sup> These data reflect only the evaluation sample in the impact study, not the entire population served.

## Appendix C: Quality of the Evidence

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Although an evaluation may not have been reviewed by the time of publication for this summary, it is possible that the study will be reviewed at a later date. Please visit the websites found in the footnotes on this page to check for updates.

### WHAT WORKS CLEARINGHOUSE REVIEW<sup>ii</sup>

STUDY	RATING
Not reviewed as of 01/23/2020	N/A

### EVIDENCE FOR ESSA REVIEW<sup>iii</sup>

STUDY	RATING
Not reviewed as of 01/23/2020	N/A

### NATIONAL CENTER ON INTENSIVE INTERVENTIONS REVIEW<sup>iv</sup>

STUDY	RATING
Not reviewed as of 01/23/2020	N/A

# Investing in Innovation (i3) Grantee Results Summary

Development, 2010-2015

The [\*Investing in Innovation Fund \(i3\)\*](#), established under section 14007 of the American Recovery and Reinvestment Act of 2009, is a Federal discretionary grant program at the U.S. Department of Education within the Office of Innovation and Improvement. i3 grants help schools and local education agencies work in partnership with the private sector and the philanthropic community to develop and expand innovative practices that improve student achievement or student growth, close achievement gaps, decrease dropout rates, increase high school graduation rates, and/or increase college enrollment and completion rates for high-need students.

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<sup>i</sup> "High-need student" refers to a student at risk of academic failure or otherwise in need of special assistance and support, such as students who are living in poverty, attend high-minority schools, are far below grade level, who have left school before receiving a regular high school diploma, at risk of not graduating with a diploma on time, who are homeless, in foster care, have been incarcerated, have disabilities, or who are English learners. For more information see: [\*Applications for New Awards; Investing in Innovation Fund-Development Grants, 81 FR 24070 \(April 25, 2016\)\*](#).

<sup>ii</sup> <https://ies.ed.gov/ncee/wwc/FWW>

<sup>iii</sup> <https://www.evidenceforessa.org/>

<sup>iv</sup> <https://intensiveintervention.org/>